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ABSTRACT

A review of ecological problems facing human society is presented and the relationship of education to social change is considered. Basic environmental limitations which are discussed include population; basic materials such as food, fuels, and water; and environmental tolerance. Ecological hazards which combine with these limitations to result in urgent social problems include laboratory created disease, ozone layer destruction by fluorcarbons, carcinogens in consumer products and food, toxic substances in food, and deforestation. These problems remain largely unsolved in spite of technological interventions of various types including drugs which improve intelligent behavior and enhance awareness, stamina, strength, health, and maximum life-span potential; genetic planning; man/machine symbiosis; and extra terrestrial communication. Educational tactics and strategies which are currently being employed to prepare students for future society include back to basics, deschooling society, career education, tracking and specialized training, behavior modification, racial integration, bilingual and multicultural education, environmental studies, learning by objectives, and computer assisted instruction. Additional research is suggested to evaluate how these strategies encourage social change in desired directions and prepare young people to live in future societies. (DB)

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Education for Achieving

A

New Societal Paradigm

Ronald W. Hull

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Introduction

Human society is in grave trouble. There are a number of indications that we are fast approaching earthly limits.[1] At the same time, signs are everywhere that we are about to undergo a major paradigm shift, a transformation of monumental proportions, which will propell us further than we can immagine and place us on a scale of responsibility unknown in human existence.[2]

Because peril to human existence is so great, it is important that we assist a transformation if we can. Education is a powerful change agent. It is therefore important to understand how education may be employed to achieve a transformation.

Questions to Be Answered

If education can be used to bring about a positive paradigm shift, the following questions need to be answered:

1. What kinds of educational strategy are required to bring about a positive new human paradigm?

and

2. What value are currently pursued educational strategies for:

   (a) Achieving a positive paradigm

   and

   (b) Preparing young people for living and working in a new paradigm society 10, 20, 50, or 100 years hence?

Why a New Paradigm is Needed

We share a planet where the circle is closing fast. The primary limits include those of population, basic materials, and environmental tolerance. The future of these limits is as yet unknown, but numerous studies and speculations have been offered in each area.

Population. Since the classic implication that population growth was geometric made by Thomas Malthus in the 18th century, the first recognition that human population posed serious problems was made by Paul Ehrlich in 1968.[3] Since that time, it remains uncertain what direction population will take. From about one million people in the primitive state, human population on the earth has grown to about 4.6 billion people. The long term outlook includes the following options:

1. Zero population growth (ZPG) case. If the birthrate could be maintained at zero as advocated by Ehrlich, world population continue to grow for 70 years until an equiliburim of 6-7 billion was reached about 2050.[4]

2. Most likely or "surprise free" case. The Hudson Institute has determined that economic and educational pressures will gradually reduce world birthrate until the human population would stablize at 15 billion about 2150.[5]

3. Worst case. If there is nothing to check the trend of population growth, the human population will reach 57 billion by 2074 and shortly overheat the earth's atmosphere.[6]

4. ExoEarth case. Once human settlements are established in space, it can be expected that the populations of these frontier settlements will grow exponentially.[7]

Resources. The primary resource needs of the population include water, energy, materials, and food, the understanding that these were finite and thus limited first became fully understood after the report of the Club of Rome from the dynamic world resource models developed by Jay Forrester and others at MIT.[8]

Water is abundant. Clean water is not. Although enough water to quench the thirst of 4.6 billion souls is relatively easy to obtain, water for farms and industrial processes is not. Many of the world's fertile areas are undergoing desertification, underground aquifers are becoming poisoned with chemicals, and the industrial world's rain has become acid. The ultimate disaster would be if the living ocean were to die.[9]

Energy has become a big issue because the human population has become so dependent on it in a readily available form. The energy future holds four kinds of energy source, each one with its limits: The fossil fuels, the renewables, nuclear fission, and the unlimiteds.

1. The fossil fuels are finite and rapidly being depleted. Although estimates vary, crude oil will last perhaps 100 years, gas perhaps 70 or 100, and coal 200 years. Conservation will only prolong the agony. Tar sands, oil shale, and other exotic fossils require technological breakthrough to become productive. Before the fossils are used up, however, environmental degradation may force their demise.

2. The renewable sources are also limited. In the face of the rising energy expectations and population, their renewability will be ever declining. Water power sources can perhaps be doubled at great cost, becoming an insignificant source by 2050. Wind has 15 times the potential of water, but capital and maintenance costs will be immense. Wood, the primary energy source of the developing nations, will decline to a trickle against other needs and uses. Biomass has potential similar to wind but with limitations similar to wood.

3. The nuclear fission sources are limited and dangerous. Not only uranium suitable for processing in limited supply, perhaps 100 years at current use rates, but the use of uranium opens a Pandora's Box of potential hazards. Light water reactors currently in use have many radioactive areas, and contain radioactive fluids, and gases. The potential for leaks and other failures is great. Meltdown of the core is possible, though remote. Wastes generated by the plants have no effective disposal. The danger lies not just in potential castastrophe, but also in the long-term effects of periodic doses of radiation released by accidents.

The breeder reactor which can produce fissionable plutonium from uranium 238 promises to extend the useable uranium reserves perhaps 200 years, but the production of highly toxic plutonium produces other problems of a more serious nature such as the potential use of plutonium by terrorists.

4. The unlimited sources which rely on nearly inexhaustible energy sources which are basically "free" are proving to be too expensive. Using a simple equation where energy out must equate or exceed energy in, a technique called net energy analysis has found that most of the unlimiteds including geothermal, solar photovoltaic, power tower, ocean thermal gradient, solar power satellites, and nuclear fusion approaches will not produce enough energy over their facility operating lives to cover costs of planning, construction, and operation.[10] Net energy analysis has come under some criticism, but it is a fact that these sources will be extremely expensive to tap.

Materials have become increasingly more difficult to obtain. Most mining and other extractive activities have focused on "rich" natural sources. these sources are rapidly being depleted and efforts to obtain and refine lower grade materials are both expensive and destructive of the ecology. In some cases, like coinage, inferior substitutes have had to be made. As a result, gold and silver coins are no longer in daily use, having been replaced by copper composites and aluminum alloys. On the other hand, the replacement of copper wires by glass fiber cables can be considered a superior substitute albeit still costly to produce. With light wave transmission on glass cables a number of advantages over the old copper wires can be obtained.

Food can be said to be a product of the application of energy to material resources. Although it may continue to be possible to feed the growing masses, the cost and ecological damage will continue to grow. Wild, natural land produces the most protein. Farming reduces diversely productive lands to dependent monocultures susceptible to diseases and soil depletion. "Miracle" hybrids have not kept pace with population growth. To "farm" the sea appears less and less a solution. The chemical processing of food has made it ever more expensive and dangerous. Extensive farming of marginal lands is creating deserts, poisoning the soil, and creating irreversible damage.

Which brings us to the ecology. The technological human society has substantially altered the ecology of our planet. Some of the effects are highly visible like urban blight, nuclear destruction, oil spills, or strip mining. Others can only be seen in a microscope, an aerial view, or chronological record. It is the secondary, tertiary or beyond effects which are potentially the most dangerous. They lie in hiding for years, then rise up to present us with monumental problems. A partial list of the man-made ecological hazards is shown. These are only the ones that are known.

1. Laboratory created disease
2. Ozone layer destruction by fluorocarbons
3. Carcinogens in consumer products and food
4. Increased atmospheric CO_2
5. Gene pool deterioration
6. Mercury in food chains
7. DDT, PCBs, Kepone, and other toxic substances in food chains
8. Tropical deforestation

In the face of all this peril and insolvability, hope springs eternal that some magic transformation will take place and save us from our trouble. There are a number of indications that a transformation is possible, and that it is taking place.

Alternatives

Assuming that the present course cannot continue, a number of optional paradigms present themselves:

1. Socialist success
2. Central project
3. Cosmic culture
4. Postindustrial society

Socialist Success

As Marx foresaw in his Communist Manifesto in 1848 the nature of the capitalist society would bring its own downfall. He defined a classless society where all men would share the fruits of labor. His ideas were slow to take root and difficult to implement but the fact is that his ideas of political economy now dominate over half the world and socialist reforms have even changed the nature of the most capitalist economies. Communist regimes have solved problems of population growth and ecological destruction without substantially improving the lot of the proleteriat in countries as vast as Red China.

In 1974, when economist Robert Heilbroner viewed the human prospect, he concluded that only under strict social control could human society escape ultimate diseaster. In 1976, he laid the blame squarely on business society and forecast its demise.[11] Under worldwide socialism, society would be transformed.

Central Project

Humankind has risen to the task when called upon to accomplish the impossible. The great pyramids were built in 100 years. The Third Reich rose from inflation and depression in 15 years. The United States landed men on the moon within 10 years of setting the goal.

In 1964, Marshall McLuhan first described the power of emerging electronic communications to create worldwide dialogue, a "global village".[12] Gerald Feinberg proposed a project called "Prometheus", to begin to set worldwide goals, especially on those problems of monumental and far-reaching importance.[13]

In response to a human condition brought on as a response to rapid life changes described as "future shock", Alvin Toffler suggested that everyone get involved in the planning process by participating democratically. The advent of sychronous satellites and devices like the consensusor and computer conferencing bring closer the day when all men will participate in worldwide goal-setting.

Upon achieving consensus as to which problems need to be addressed first, it seems possible that the human race will solve them one by one, and thus effect a major transformation of the world society.

Cosmic Culture

Beginning with the discovery of the evolution of species in the 19th century, scientists of the 20th century have slowly unraveled the mystery of the origins of existence as far back as the origin of the universe, perhaps eleven billion years ago.[14]

In a very poetic way, Peirre Teilhard de Chardin described an evolutionary spiral in the 1950s which predicted a higher order of man (Alpha to Omega) rising from the origin of the universe like layers on an onion, each layer more intelligent and complex than the next yet containing all the matter and energy of the beginning on a course set by a cosmic force.[15]

Arthur Clarke and Barbara Hubbard have agreed with this thesis.[16] The logical step for humankind is to leave the planet and seek its destiny on a higher plane. It is unlikely that Darwinian natural selection can effect a transformation to Omega or cosmic man, perhaps another way can.

Postindustrial Society

There are definite stages which can be discerned when one examines the progress of humankind. Certain periods stand out as turning points in civilization. About 10,000 years ago, the first written languages recorded

the beginnings of settlement, farming, science, government, commerce, and other activities associated with being human that separated man from the ecology for the first time. Another period of rapid and profound change accompanied introduction of the steam engine, the factory, and the use of fossil fuels in the industrial revoltuion circa. 1700 to 1900 AD. The introduction of the electronic digital computer and the concepts of automation and cybernation in 1946 ushered in a new era of profound dimensions as yet not fully understood.

Observing these changes, Daniel Bell and others have envisioned a "post-industrial" society of the future which might represent a transformation.[17] Willis Harman has explored some of the dimensions a new "paradigm" society might take on which includes some of the alternatives (socialist success) previously discussed.[18]

Because the post-industrial society promises to be so complex, it has become the task of major research institutions to attempt to model it. The most systematic approach has been taken by the Hudson Institute under the direction of Herman Kahn. He and his colleagues have developed numerous scenarios of a society which will undergo a transformation, particularly in an economic sense.[19]

An Approach

The unique characteristic of man is his technology. Only Homo Sapiens creates and uses technology. Perhaps technology is required to achieve Omega man, the successor to Homo Sapiens. It is possible to divide the progress of technology into stages, each stage more complex than the next, each stage redefining the nature of what it is to be human.

Technological Transformation

The following progression outlines the known and potential stages technology can assume:

Stage	Description
I. Pretechnology (to 1.5 million BP)	. Intelligent beings may have existed since 4 million BP. No evidence of tool use.
II. Primative Technology (to 10,000 BC)	. Evolution creates large-brained tool-using creature, Homo-Sapiens. Some men achieve greatness, but no evidence remains.
III. Instrumental Technology (to 1700 AD)	. Some men build civilizations and begin systematic institution-building and technological development. Course of evolution is altered.
IV. Industrial and High Technology (to 19?? AD)	. Many men rapidly alter environment and profoundly affect evolution. knowledge-based technology grows exponentially. Man becomes truly dominant species worldwide.
V. Post or Super Technology (unknown)	. Direct connection with other galactic intelligences. No known paradigm applies.

Each stage brings humankind to a higher level of existence. However, man himself does not change. At no point except perhaps extraterrestrial contact does Alpha become Omega. That requires an intellectual transformation.

Intellectual Transformation

Just as the passage of technology can be traced from state to stage, scientific investigation is uncovering the progress of man as an intelligent being. Darwinian evolution appears to have brought a transformation which resulted in a creature we call man. The progression took millions of years and roughly follows this pattern:

Stage	Description
I. Manlike ape (4 to 1.5 million BP)	• Natural evolution creates an upright, small-brained social creature who hunts and gathers. Environment not used systematically.
II. *Apelike man (1.5 to 1000,000 BP)	• Natural evolution creates a large brained creature which uses environment in an effective way, using tools and social organization to advantage.
III. Man (Alpha) (100,000 BP to?)	• Natural evolution creates man the thinker (Homo-Sapiens) who conquers all other challenging creatures. Tool use is effective and alters natural evolution.
IV. *Super man (Omega) (? to contact)	• Cosmic man will have solved earthly problems, be free of earth biosphere, and seek other intelligent life.

* Transformation Points

The era of man, especially the last 10,000 years, has been a violation of the natural evolution of Darwin. Humankind is now the dominant species, sustained by the extensive use of technology. The ecological niche is occupied and closing fast. Since technology got us into this situation it is understandable that technology can get us out. Man must become super man.

Technological Intervention

A number of technologies have the potential to transform man to super man. These technologies are rapidly being developed and may effect a transformation in this century. Table I provides a brief survey of the technologies, breakthroughs, expected time to breakthrough, and impact.

Work on all of these technologies is underway. With breakthrough, a transformation may be rapid and severe, creating a new paradigm very quickly. Since we view education as a means for preparing people for living in society, should not education address the possibility of a new paradigm, perhaps assist preparation for it?

TABLE I

Intervention Technologies

Technology	Breakthrough Points	Expected Impacts	Linkage to Other Technologies	Time Breakthrough (Probability)
I. Chemical Intervention (Drugs)	1. Improved intelligent behavior.	1. Gradual, problems with side effects.	1. Chemical DNA	1. 10-25 years * (80%) *
	2. Enhanced awareness, emotional behavior, stamina strength, health.	2. Not inherited.	2. Chemical intervention in genetic transfer at conception.	2. 0-20 (100%)
		3. Increase individual differences.	3. Reduction of the "aging" mechanism by chemicals	
II. Prolonged Life	1. Increased Maximum Lifespan Potential (MLP).	1. Gradual, more productivity per individual.	1. DNA recombination leading to increased MLP.	1. 10-50 (80%)
	2. Retardation of aging systoms.	2. Hierarchical management by seniority questioned.	2. Genetic planning to increase MLP.	2. 0-50 (100%)
		3. Birth control redefined.		

* Estimates by the author which require verification by the experts in each field.

TABLE I (continued)

Intervention Technologies

Technology	Breakthrough Points	Expected Impacts	Linkage to Other Technologies	Time Breakthrough (Probability)
III. Genetic Planning	1. Genius or long, productive life planning.	1. Gradual, several generations with full cooperation.	1. May be speeded by DNA recombination.	1. 20-70 (90%)
	2. Elimination of specific genetic diseases, i.e., Down's syndrome.	2. Possible reduction of gen pool range and vitally.	2. Planning to increase MLP will be first work.	2. 20-50 (100%)
		3. Potentially great impact.	3. Cloning will require strict planning control.	
IV. Man/Machine Symbiosis (Bionics)	1. Neuron-operated control mechanism.	1. Gradual, primarily the physically handicapped.	1. Productive life of individuals increased.	1. 20-50 (70%)
	2. Microminature batteries and motors.	2. Individuals attain superhuman (physical) abilities.	2. Artificial intelligence may complement bionics.	2. 5-30 (100%)
	3. Computer-brain linkage.	3. Not inherited.		3. 20-70 (80%)

TABLE I (continued)

Intervention Technologies

Technology	Breakthrough Points	Expected Impacts	Linkage to Other Technologies	Time to Breakthrough (Probability)
V. DNA Recombination	1. Elimination of genetic defects in offspring.	1. Rapid, changes could occur in one generation.	1. Chemicals may be used to alter DNA	1. 10-30 (90%)
	2. Creation of Superior genotypes.	2. Potential for super-human traits with accompanying problems.	2. Chemically-sensitive genes may be developed.	2. 10-30 (90%)
			3. MLP genes may be altered.	
			4. Genetic planning will have to accompany DNA recombination work.	
VI. Cloning	1. Birth of a human baby from a single human cell.	1. Gradual, cloning should not be widespread.	1. Must be linked to genetic planning for control.	1. 10-30 (95%)
		2. Political use will have to be controlled.	2. DNA recombination could create superior clones.	

TABLE I (continued)

Intervention Technologies

Technology	Breakthrough Points	Expected Impacts	Linkage to Other Technologies	Time to Breakthrough (Probability)
VII. Necro-Cloning	1. Birth of a human baby from dead or frozen human cell.	1. Mass reincarnation.	1. Net effect would be indefinate multiple lifespans.	1. 30 to never (20%)
		2. Recovery of historic genotypes and extinct species.	2. Advanced cloning	
			3. May be achieved through chemical stimulation.	
			4. Genetic planning essential.	
VIII. Artificial Intelligence (AI)	1. A machine that can pass the Turing test.	1. Revolution in decision-making.	1. Intelligent mechanisms could enhance bionics.	1. 30 to never (50%)
		2. Human responsibility altered. Age of Aquarius attained.	2. Genetic planning entrusted to AI.	
			3. AI may contact extraterrestrials.	

TABLE I (continued)

Intervention Technologies

Technology	Breakthrough Points	Expected Impacts	Linkage to Other Technologies	Time to Breakthrough (Probability)
IX. Extraterrestrial communication	1. Message from aliens received.	1. Immediate transformation of unknown nature.	1. Prolonged life would enhance changes.	1. 30-150 (90%)
	2. Close encounter.		2. Artificial intelligence more suited to contact.	2. 0 - 1000

Questions to be Addressed

It is important that we decide now whether or not an intellectual transformation is possible and/or desirable. If an intellectual transformation is desirable, is it possible for us to use education to hasten its coming? If so, what strategies and tactics should we employ?

A number of strategies and tactics for education are now being employed in our societal paradigm. These approaches need to be evaluated and reconsidered if the educational institution is to play a role in the transformation process.

Strategies

Back to basics
Deschooling society
Tracking and specialized training
Career education
Behavior modification

Tactics

Biligual education
Busing for racial equality
Metric education
Women's equity education
Energy education
Environmental education
Computer-assisted instruction
Learning by objectives
Science education
Technical education
Art education

Notes

1. See Robert L. Heilbroner. An Inquiry into the Human Prospect. New York: W. W. Norton, 1974. Donella Meadows, et al. Limits to Growth. New York: Universe Books, 1972. And Paul and Anne Ehrlich. End of Affluence. New York: Ballantine, 1974.

2. Arthur C. Clarke's science fiction novel, Childhood's End, describes an earth visited by superior aliens. We may be forced to "grow up" without the threat of alien invasion.

3. Ehrlich, Paul R. The Population Bomb. 1968.

4. Ehrlich started the zero population growth (ZPG) movement in 1970. Since that time the U. S. Achieved a zero birthrate in 1972 and several developing countries have adopted ZPG strategies. Communist China provides the most outstanding example of national population planning and control.

5. Kahn, Herman, et al. The Next 200 Years. New York: Morrow, 1976.

6. Heilbroner, Op. cit. Pp. 33, 51.

7. An idea proposed by Arthur C. Clarke in The Promise of Space (New York: Harper and Row, 1968) was that human population could expand outward into space at the speed of light. Realistically, it seems that once space settlements are established, population growth will continue in space even if earth population is stabilized.

8. Donnella Meadows, et al. Op. cit. The World I and World II computer-assisted dynamic programming models developed at MIT were used to generate the results.

9. See Paul Ehrlich's scenario of the death of the ocean in Alvin Toffler. The Futurists. New York: Random House, 1972 Pp. 13-26.

10. Heilbroner, Robert L. Business Civilization In Decline. New York: W. W. Norton, 1976.

11. McLuhan, Marshall. Understanding Media. New York: McGraw-Hill, 1964.

12. Feinberg, Gerald. The Prometheus Project. Garden City, NY: Doubleday, 1960. p. 13.

13. Some scientists say 15 billion years. Eleven billion years was the figure used in Robert Zastrow's address, "God and the Astronomers" before the 144th annual meeting of the AAAS in Washington, D. C., January 1978.

14. Teilhard de Chardin, Pierre. The Phenomenon of Man. 1955. p. 148.

15. Clarke's screenplay, "A Space Odyssey: 2001" (1969), depicts the arrival of a "super" man in the form of a baby transformed from an astronaut. Barbara Hubbard's "Theatre of The Future" (1979) is based on this premise.

16. Bell, Daniel. The Coming of Post-Industrial Society, New York, 1973.

17. Harman, Willis. The Coming Rransformation. The Futurist 11:1:4-12 February, 1974.

18. Kahn, et al. Op. cit.

Appendix

Survey Instruments

Education for a New Societal Paradigm

Completed By

The Participants in Minneapolis on
October 19, 1979

Evaluation of Existing United States Strategies for Educational Change

(Circle One)

	Impact on Transformation				
	Inhibit		No Change		Assist
Strategies					
1. Back to Basics	1	2	3	4	5
2. Deschooling Society	1	2	3	4	5
3. Tracking and Specialized Training	1	2	3	4	5
4. General Education	1	2	3	4	5
5. Career Education	1	2	3	4	5
6. Behavior Modification	1	2	3	4	5
Tactics					
1. Programatic and Computer-Assisted Instruction	1	2	3	4	5
2. Busing to Achieve Racial Desegregation in Schools	1	2	3	4	5
3. Metric Education in Schools	1	2	3	4	5
4. Mainstreaming of Physically, Mentally, and Emotionally Handicapped	1	2	3	4	5
5. Bilingual Education	1	2	3	4	5
6. Cost Reduction and Tax Reform and Schools	1	2	3	4	5
7. Women's Equity Education	1	2	3	4	5
8. Environmental Education	1	2	3	4	5
9. Learning by Objectives	1	2	3	4	5
10. Science Education	1	2	3	4	5
11. Arts Education	1	2	3	4	5
12. Technical Education	1	2	3	4	5

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October, 1979

New Paradigm Survey

Name_____

Position_____ (Optional)

Place_____

1. Is intellectual transformation desirable?

   ☐ Yes ☐ No ☐ Maybe ☐ Don't know
   Comment:

2. Can we positively influence intellectual transformation?

   ☐ Yes ☐ No ☐ Maybe ☐ Don't know
   Comment:

3. Are there any strategies (or tactics) you would apply to affect a transformation? List

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